

ABSTRACT OF THE INVENTION

A conventional direct methanol solid polymer fuel cell comprises a solid polymer electrolyte as an electrolyte. This type of cell involves some problems; methanol permeates the membrane; the electromotive force lowers because of direct oxidation; and the membrane melts at about 130 °C when the temperature is increased to enhance the catalyst activity. According to the invention, an electrolyte membrane made of a porous substrate (1) that does not swell substantially with methanol and water and has pores (2) filled with a polymer (3) having proton conductivity is produced and used to suppress the permeation of methanol as much as possible, providing an electrolyte membrane for fuel cells endurable in a high-temperature environment, a fuel cell comprising such a membrane, a method of manufacturing such a fuel cell, and a method of manufacturing an electrolyte membrane comprising irradiation a porous substrate having swell-resistance against organic solvent and water with energy and contacting the substrate with a monomer to cause polymerization.